

## FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

Please fill in the highlighted areas

*all sections (IA, IB, IC, etc.) must be addressed or the application will be considered invalid*

### I. APPLICANT INFORMATION

- A. Applicant Name: Montana Fish, Wildlife & Parks - Water Program
- B. Mailing Address: PO Box 200701
- C. City: Helena State: MT Zip: 59620-0701
- Telephone:  E-mail:
- D. Contact Person: Andy Brummond
- Address if different from Applicant: PO Box 938
- City: Lewistown State: MT Zip: 59457
- Telephone: 406-538-2445 ext. 224 E-mail: abrummond@mt.gov
- E. Landowner and/or Lessee Name (if other than Applicant): Church Universal and Triumphant is the water right lessor
- Mailing Address:
- City:  State:  Zip:
- Telephone:  E-mail:

### II. PROJECT INFORMATION\*

- A. Project Name: Mulherin Creek Instream Flow Water Lease Renewal
- River, stream, or lake: Mulherin Creek
- Location: Township: 8 South Range: 7 East Section: 24
- Latitude: 45.133 Longitude: -110.814 *within project (decimal degrees)*
- County: Park
- B. Purpose of Project:
- The purpose of the project is to renew an existing instream flow water lease on Mulherin Creek for a period of 10 years.
- C. Brief Project Description:
-

## Mulherin Creek instream flow lease renewal

The objective of this project is to preserve the status quo regarding stream flow and Yellowstone Cutthroat Trout recruitment from Mulherin Creek for the next 10 years. The current instream flow water lease has been in place for 19 years and expires after the 2018 irrigation season. The lease is for a range of flows from 5 to 27 cfs, including the most senior right on Mulherin Creek. The lease guarantees that 5 cfs remain instream before any water is taken for irrigation by the lessor.

The proposal would renew the lease for 10 years, the maximum period allowed under present state statute. However, the lease renewal agreement provides for four additional 10-year renewals, if allowed by law at the time of renewal. The future price is set using the same means by which the current renewal price was determined.

The attached memorandum provides information regarding the importance of these water rights to in-stream flow and the fishery along with an explanation of the how the lease cost was determined.

While the project does involve water rights changed to in-stream flow, the detailed information regarding the change in water use has already been provided to and approved by DNRC as part of the existing lease.

The attached map shows the project location.

D. Length of stream or size of lake that will be treated: 0.5 miles from mouth to diversion

E. Project Budget:

**Grant Request (Dollars):** \$ ~~76,350~~ \$38,175 (revised request)

Contribution by Applicant (Dollars): \$ \$38,175 (revised) In-kind \$  
(salaries of government employees are not considered as matching contributions)

Contribution from other Sources (Dollars): \$ 0 In-kind \$  
(attach verification - See page 2 budget template)

**Total Project Cost:** \$ 76,350

F. Attach itemized (line item) budget – see template

Attach **specific project plans, detailed sketches, plan views, photographs, maps, evidence of landowner consent, evidence of public support and fish biologist support, and/or other**  
G. **information necessary to evaluate the merits of the project. If project involves water leasing or water salvage complete a *supplemental questionnaire***  
(fwp.mt.gov/habitat/futurefisheries/supplement2.doc).

H. **Attach land management & maintenance plans that will ensure protection of the reclaimed area.**

### III. PROJECT BENEFITS\*

A. What species of fish will benefit from this project?:

Yellowstone Cutthroat Trout is the focus species of the project. Mountain Whitefish and Mottled Sculpin, both native species are also present. These species as well as Rainbow and Brown Trout may also benefit although benefits to rainbow trout if any are expected to be minimal.

B. How will the project protect or enhance wild fish habitat?:

## Mulherin Creek instream flow lease renewal

This project would allow FWP to continue to protect priority Yellowstone cutthroat spawning and rearing habitat by maintaining an instream flow in lower Mulherin Creek of no less than 5 cfs. This maintains adequate water cover over most redds allowing for successful emergence and outmigration to the Yellowstone River.

- C. Will the project improve fish populations and/or fishing? To what extent?:

The project is intended to protect existing Yellowstone cutthroat populations in both Mulherin Creek and the Yellowstone River. The benefits to the fishery have already been realized through the existing water right lease and are expected to be maintained if the lease is renewed.

- D. Will the project increase public fishing opportunity for wild fish and, if so, how?:

Through maintaining existing Yellowstone Cutthroat populations, the project would protect existing public fishing opportunities in Mulherin Creek and the Yellowstone River. Continuing declines in Yellowstone cutthroat populations throughout its range could ultimately limit angling opportunities due to Endangered Species Act considerations. Maintaining the Yellowstone cutthroat strongholds in places like the upper Yellowstone not only provides for tremendous public fishing opportunities but also is critical in thwarting the potential for listing under the Endangered Species Act. The continued protection of in-stream flow in Mulherin Creek serves this purpose.

- E. The project agreement includes a 20-year maintenance commitment. Please discuss your ability to meet this commitment.

Maintenance of the project would involve ongoing biological and hydrological monitoring. FWP is committed to this ongoing monitoring both to ensure a return on the investment as well as to monitor the trends in Yellowstone cutthroat recruitment. The term of the renewal is limited to 10 years by §85-2-436(3)(e) MCA.

- F. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?:

Yellowstone cutthroat spawning, rearing and fry out migration to the Yellowstone River was historically limited by irrigation water diversions causing dewatering of the stream. This habitat degradation has been corrected through the existing leases. This project would serve to ensure that the habitat degradation is corrected for at least the next 10 years. This project also serves to mitigate hydrologic changes associated with climate change.

- G. What public benefits will be realized from this project?:

The public benefits realized from this project will be the continuation of angling opportunities on the upper Yellowstone River that may otherwise be threatened over the long-term. It will help ensure the persistence of a Yellowstone Cutthroat.

- H. Will the project interfere with water or property rights of adjacent landowners? (explain):
-

## Mulherin Creek instream flow lease renewal

The existing water lease has been in place for 19 years and has not resulted in any injury to existing water rights. If necessary during periods of low flow usage of junior water rights may be curtailed to provide instream water under the more senior water rights being leased. This impact to junior rights existed prior to the lease and the implementation of conservation measures that have reduced the demand for irrigation water under the senior water rights.

During this lease renewal process DNRC notifies water users that may be potentially adversely affect by the continuation of the lease and gives them the opportunity to provide evidence of adverse effects that has not been previously considered. If new evidence is provided a new temporary change application for instream flow must be filed with DNRC and FWP must prove that other water users will not be adversely affected. It has not been necessary to request that a water commissioner distribute water.

- I. Will the project result in the development of commercial recreational use on the site?: (explain):

As the project will preserve the status quo it is not anticipated that it would influence new development of recreation use on the upper Yellowstone River or Mulherin Creek.

- J. Is this project associated with the reclamation of past mining activity?:

No

**Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.**

#### IV. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: /s/ Andy Brummond

Date: 5-29-18

Sponsor (if applicable):

**\*Highlighted boxes will automatically expand.**

**Mail To:** Montana Fish, Wildlife & Parks  
Fisheries Division  
PO Box 200701  
Helena, MT 59620-0701

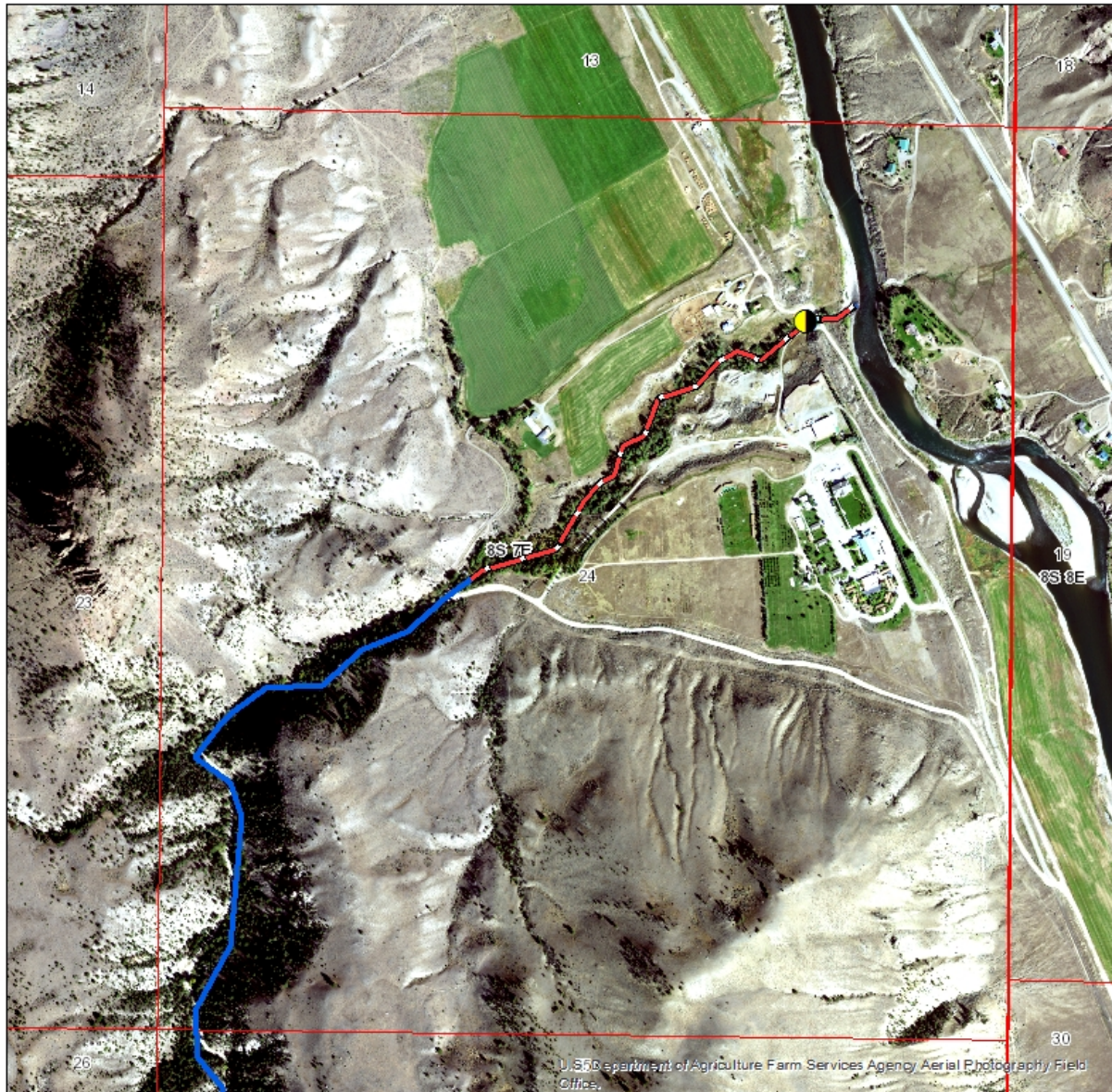
**E-mail To:** Michelle McGree  
[mmcgree@mt.gov](mailto:mmcgree@mt.gov)  
(electronic submissions MUST be signed)

Incomplete or late applications will be rejected and returned to applicant.  
Applications may be rejected if this form is modified.






## Mulherin Creek instream flow lease renewal

**\*\*\*Applications must be signed and *received* by the Future Fisheries Program Officer in Helena before December 1 and June 1 of each year to be considered for the subsequent funding period.\*\*\***



### Legend

-  Measurement\_Point
-  Flow\_Restoration\_Reach
-  Mulherin\_Creek



## MEMORANDUM

To: FFIP Application - Mulherin Creek Instream Water Right Lease Renewal

From: Andy Brummond, FWP Water Conservationist  
Scott Opitz, Livingston Area Fisheries Biologist

Date: May 25, 2017

Subject: Benefits of Mulherin Creek Instream Water Right Lease

---

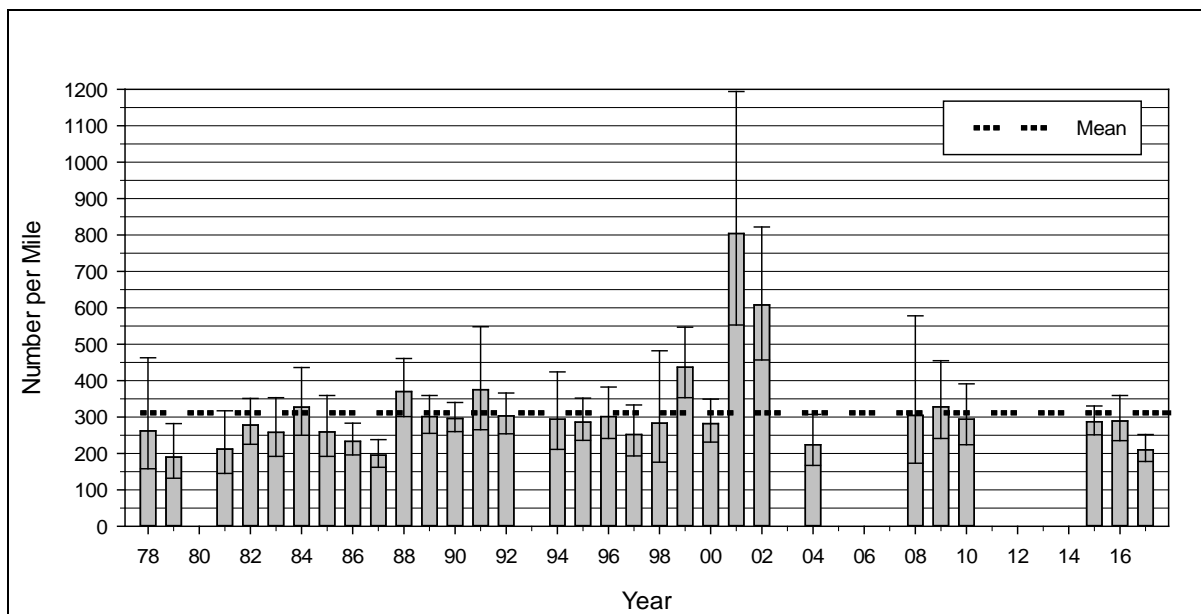
The current instream water lease on Mulherin Creek, a tributary to the Yellowstone River near Corwin Springs, expires on December 31, 2018. The lease is with the Church Universal and Triumphant and has been in place for 19 years with 1 year remaining.

The lease is for a range of flows from 5 to 27 cfs with a 5 cfs minimum that is superior to any diversions by the Church. The focus of the lease is to maintain flow in the lower ½ mile of Mulherin Creek below the Church's lowest diversion. The lease includes the most senior water rights on Mulherin Creek proper. Within the Mulherin Creek Basin there is only one 2.5 cfs tributary irrigation right senior to the rights being leased. The water leased for instream flow was created when the Church switched from flood to sprinkler irrigation at the time the original lease was put into effect. The total of the rights being leased is 47.33 cfs of which FWP leases up to 27 cfs leaving 20.33 cfs available for the Church's irrigation.

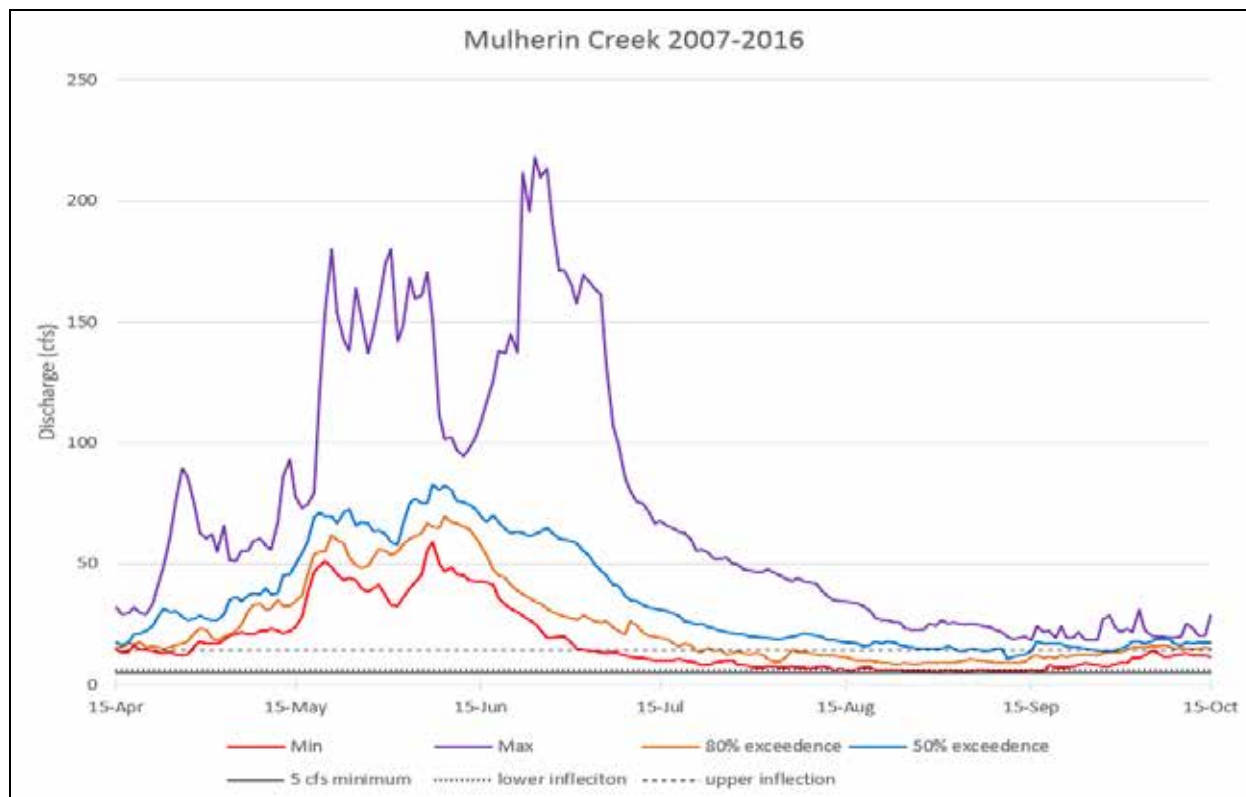
The Corwin Springs Section of the Yellowstone River remains a stronghold for Yellowstone Cutthroat Trout (YCT). Mulherin Creek provides critical YCT spawning for this section of the Yellowstone River. YCT adults migrate into Mulherin Creek and its tributaries to spawn on the falling limb of the hydrograph with fry emerging in late August and emigrating to Yellowstone River.

The importance of Mulherin Creek as a spawning tributary has been recognized since the early 1970s (Berg 1975), and subsequent investigations found Mulherin Creek to be among the most heavily used spawning tributaries in the upper Yellowstone River (Clancy 1988, DeRito 2004). Mulherin Creek is a major contributor of YCT fry to the Yellowstone River (Roulson 2002). These factors make Mulherin Creek a highly valuable stream in YCT conservation.

## Mulherin Creek instream flow lease renewal



FWP has collected continuous flow data below the lower diversion near the confluence with the Yellowstone River since 2007. The following hydrographs show the minimum, maximum, 80% exceedance and 50% exceedance (median) daily flow for the 10 years of record in comparison to the 5 cfs minimum flow in the present water lease, the 6 cfs lower wetted perimeter inflection point and the 14 cfs upper inflection point.

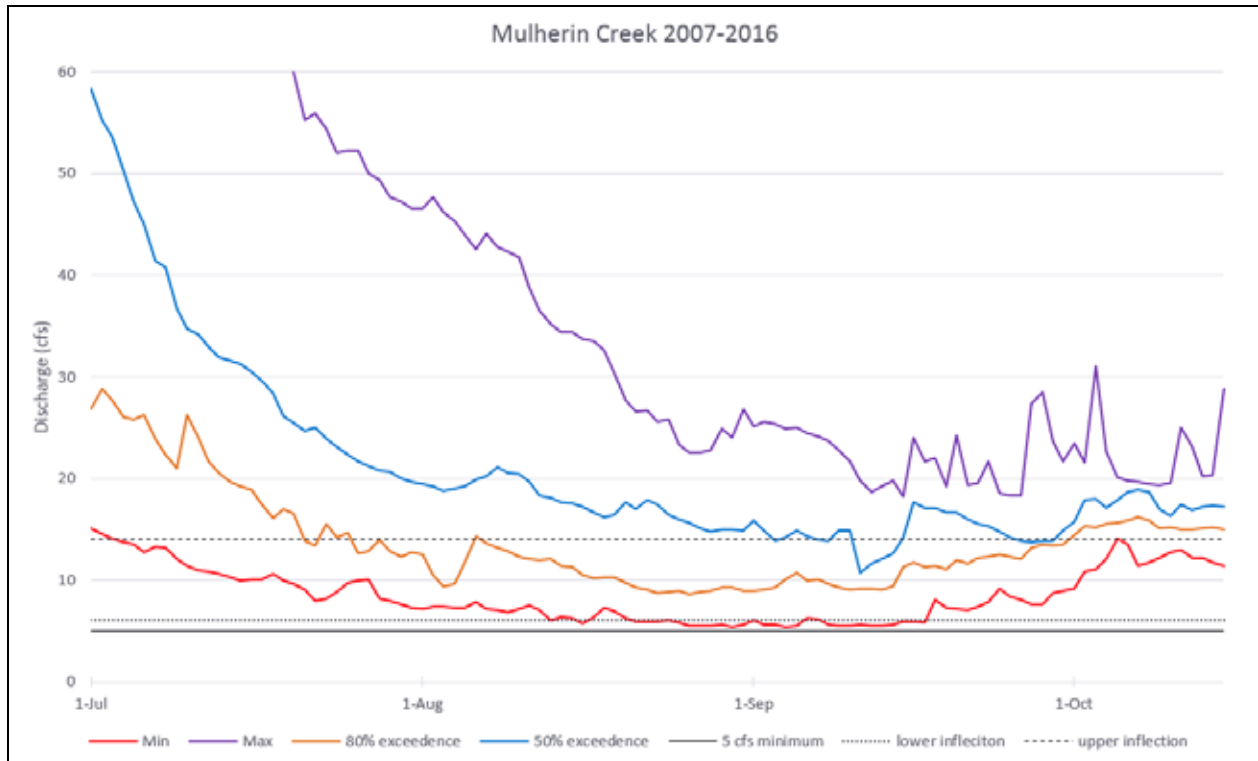




### Mulherin Creek instream flow lease renewal

The hydrograph below focusses on the critical summer period. With the water lease in place flow under the worst conditions has maintained between 5 and 6 cfs showing that the 5 cfs minimum has been met. Also, the flow has not dropped significantly below the 6 cfs lower inflection point indicating that riffles and hence redds remained mostly covered with water.

50% exceedence flows remained at or above the 14 cfs upper inflection point through early September indicating that the riffles and redds were most likely fully covered with water until fry emerged and could emigrate to the Yellowstone River.



Without the water lease in place that helped fund the change from flood to sprinkler irrigation, flows would have undoubtedly approached zero in many years at the critical time just prior to and during YCT fry emergence. This would have negatively impacted or potentially eliminated fry emigration to the Yellowstone River as the fry would be diverted into the Church's lower diversion. Further, redds below the lower diversion would have been exposed prior to fry emergence. The water lease has met its original objectives.

The payment of the original 20-year lease was a one-time payment of \$100,000 at the beginning of the lease. This payment helped the Church offset the cost of installing the sprinkler system that created the water savings that was leased for instream flow. In the past year the Church has updated that sprinkler system and is likely looking for additional money to help offset these system improvements.

Using the Consumer Price Index (CPI) Inflation Calculator from the U.S. Bureau of Labor Statistics, \$100,000 in August 1997 would be worth \$152,686 in August 2017, 20 years later. By statute the lease can only be renewed for 10 years instead of the original lease 20-year term. One half of the inflation adjusted payment of \$152,686 or **\$76,350** would be an appropriate for a 10-year term.



Literature Cited

Berg, R. 1975. Fish and game planning, upper Yellowstone and Shields River drainages. Montana Department of Fish and Game. Environment and Information Division. Federal Aid to Fish and Wildlife Restoration Project.

Clancey, C. 1998. Effects of dewatering on spawning by Yellowstone cutthroat trout in tributaries to the Yellowstone River, Montana. American Fisheries Society Symposium 4:37-41.

DeRito, J. N. 2004. Assessment of reproductive isolation between Yellowstone cutthroat trout and rainbow trout in the Yellowstone River, Montana. Master's Thesis, Montana State University, Bozeman, Montana.

Roulson, L. H. 2002. Water leases and Yellowstone cutthroat trout fry outmigration from four tributaries of the upper Yellowstone river, project year 2001. Report prepared for Montana Fish, Wildlife & Parks. Garcia and Associates, Bozeman, Montana.

Mulherin Creek instream flow lease renewal  
**BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS**

Both tables must be completed or the application will be returned

WORK ITEMS (ITEMIZE BY CATEGORY)	NUMBER OF UNITS	UNIT DESCRIPTION*	COST/UNIT	TOTAL COST	CONTRIBUTIONS			
					FUTURE FISHERIES REQUEST	IN-KIND SERVICES**	IN-KIND CASH	TOTAL
<b>Personnel***</b>								
Survey				\$ -				\$ -
Design				\$ -				\$ -
Engineering				\$ -				\$ -
Permitting				\$ -				\$ -
Oversight				\$ -				\$ -
				\$ -				\$ -
			Sub-Total	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Travel</b>								
Mileage				\$ -				\$ -
Per diem				\$ -				\$ -
			Sub-Total	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Construction Materials****</b>								
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
			Sub-Total	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Equipment and Labor</b>								
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
<b>Water Lease</b>								
	1		\$76,350.00	\$ 76,350.00	38,175	(request and match revised)	38,175	\$ 76,350.00
				\$ -				\$ -
			Sub-Total	\$ 76,350.00	\$ 38,175	\$ -	\$ 38,175	\$ 76,350.00
<b>Mobilization</b>								
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
				\$ -				\$ -
			Sub-Total	\$ -	\$ -	\$ -	\$ -	\$ -
<b>TOTALS</b>				\$ 76,350.00	\$ 38,175	\$ -	\$ 38,175	\$ 76,350.00

Mulherin Creek instream flow lease renewal  
**BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS**

**OTHER REQUIREMENTS:**

**All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid.** Please see the example budget sheet for additional clarification.

\*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

\*\*Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used for calculations). Describe here or in text.

Reminder: Government salaries cannot be used as in-kind match

\*\*\*The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a minimum of two competitive bids for the cost of undertaking the project.

\*\*\*\*The Review Panel recommends a maximum fencing cost of \$1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

**MATCHING CONTRIBUTIONS** (do not include requested funds)

CONTRIBUTOR	IN-KIND SERVICE	IN-KIND CASH	TOTAL	Secured? (Y/N)
FWP	\$ -	\$ 38,175 -	\$ 38,175 -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
<b>TOTALS</b>	\$ -	\$ -	\$ -	

## FUTURE FISHERIES IMPROVEMENT PROGRAM

### SUPPLEMENTAL INFORMATION SHEET FOR WATER LEASING OR WATER SALVAGE PROJECTS

The following additional information is requested to supplement the Future Fisheries Application for projects associated with water leasing or water salvage. Please complete this supplemental form and submit it as part of the Future Fisheries Grant Application.

- 1. Please complete the following table describing the water right(s) associated with the proposed project.** Note: Much of this information can be obtained either from your own water rights records or online at <http://www.dnrc.state.mt.us/wrd/home.htm> (choose “water rights” and then select an index to look up applicable claims)

RIGHT NUMBER; WATER SOURCE	POINT OF DIVERSION	QUANTIFIED FLOW (CFS)/ VOLUME (AF)/ IRRIGATED ACRES	PRIORITY DATE; PERIOD OF USE	RELATIVE PRIORITY ON WATER SOURCE	PURPOSE OF WATER RIGHT	OTHER CLAIMED ON THE STREAM SENIOR TO YOUR LISTED CLAIMS
43B 196098-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	5.0 cfs 288.8 acres Volume not quantified	July 15, 1884 April 15 to October 19	1st priority of 10 rights	Fishery Irrigation	0 cfs senior to this right
43B 196107-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	3.75 cfs 288.8 acres Volume not quantified	May 7, 1885 April 15 to October 19	2nd priority of 10 rights	Fishery Irrigation	5.0 cfs senior to this right
43B 196108-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	5.0 cfs 288.8 acres Volume not quantified	June 15, 1893 April 15 to October 19	3rd priority of 10 rights	Fishery Irrigation	8.75 cfs senior to this right
43B 185772-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	10.94 cfs 288.8 acres Volume not quantified	January 1, 1900 April 15 to October 19	5th priority of 10 rights	Fishery Irrigation	14.1 cfs senior to this right
43B 196106-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	4.0 cfs 288.8 acres Volume not quantified	March 2, 1903 April 15 to October 19	6th priority of 10 rights	Fishery Irrigation	25.04 cfs senior to this right
43B 196097-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	2.0 cfs 288.8 acres Volume not quantified	June 5, 1905 April 15 to October 19	7th priority of 10 rights	Fishery Irrigation	33.04 cfs senior to this right
43B 196105-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	5.7 cfs 288.8 acres Volume not quantified	August 5, 1920 April 15 to November 19	8th priority of 10 rights	Fishery Irrigation	35.04 cfs senior to this right
43B 196104-00 Mulherin Creek	Govt. Lot 6 NE SW Sec. 6 T8S, R7E	10.94 cfs 288.8 acres Volume not quantified	August 15, 1967 April 15 to November 19	9th priority of 10 rights	Fishery Irrigation	40.74 cfs senior to this right

## Mulherin Creek instream flow lease renewal

The change to instream flow was approved by DNRC in 1999 under Authorization to Change 43B 185772-99. The proposed project is to renew the lease/change to instream flow for a period of 10 years.

- 2. In the last 10 years, has your full water right amount regularly been available at your point of diversion throughout your period of use?**

Yes / ☒ No (Please circle one)

During periods of lower flow, the full flow rate of the water rights has not been available. However, adequate flow has been available to satisfy the irrigation demand and meet the 5 cfs minimum instream flow level required on the water lease.

**Have you ever made “a call” on junior water users to obtain the water you needed (through a water commissioner or otherwise)?**

Yes / ☒ No (Please circle one)

No call has been made since the original instream water lease began in 1999.

- 3. Please describe or include a summary of any measurements of the amount of water you have regularly diverted and how much typically flows by your diversion during different time periods.**

Between 1999 and 2005 instream flow was monitored by FWP staff recording periodic water level readings and determining streamflow from a water level – streamflow rating table developed by USGS. From 1999 through 2016 FWP contracted with USGS to take several streamflow measurements and maintain a rating table for the Mulherin Creek measurement site at the mouth.

Beginning in 2006, FWP staff installed a water level recording device and began taking more regular streamflow measurements. This data along with that collected by USGS was used to develop continuous streamflow data to monitor the effectiveness of the water lease. During the 2005-2017 period, daily average streamflow measurements show that flow in Mulherin Creek did not drop below the 5 cfs minimum found in the water lease.

- 4. Has your local FWP fish biologist confirmed that your leasing/salvage project addresses a stream flow problem that significantly limits the fishery?**

☒ Yes / No (Please circle one)



5. How much actual water (often different than just the remainder of your water rights) will be added to the stream through completion of your project?

5-27 cfs Please fill in and circle one – cfs / gpm / miners inches

5-27 cfs is the flow rate authorized by DNRC. The current water lease and the lease renewal requires that at least 5 cfs be provided instream at all times in priority over any irrigation use.

**What length of stream will benefit from this additional flow? (Note: Under certain circumstances, senior water can be protected legally from diversion by downstream junior users.)**

1/2 miles (please fill in or describe)

6. Is there a water commissioner on your stream? Yes / ☒ No (Please circle one)

Presently there is not a water commissioner on Mulherin Creek. However, the lease renewal agreement provides a mechanism by which to petition for the appointment of a water commissioner.

**Are you willing to actively assist in monitoring and/or protecting the conserved water instream?** ☒ Yes / No (Please circle one and describe)

FWP will continue to monitor the protected instream flow by taking regular (typically monthly) streamflow measurements, developing a water level – discharge relationship, and calculate continuous flow data.

Past streamflow data for Mulherin Creek in the protected stream reach is attached.

# Mulherin Creek instream flow lease renewal

## Mulheron Creek near Corwin Springs

USGS Station No. 06191550

Location: Approx. 200 ft. upstream of Confluence w/ Yellowstone, just below Old Yellowstone Trail S.

Bridge

Lat. 45 07' 39" Long. 110 48' 22" NAD

27

TWP 8S, RGE 7E, SEC 24, AAC

Average daily flow in cubic feet per second based on stage at 30-min. intervals.

Day-Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
28-Mar												29.2
29-Mar	17.1 <sup>a</sup>						20.8	13.8				28.7
30-Mar							22.9	14.1		18.3		29.3
31-Mar							29.9	14.8		19.6		29.1
1-Apr					13.4		31.9	15.9		20.8	10.0	28.9
2-Apr					13.3		28.7	16.7		18.0	10.6	30.0
3-Apr					13.1		26.3	17.6		17.3	12.1	29.1
4-Apr					13.2		27.3	18.9		16.7	14.4	28.5
5-Apr		15.9			12.7		28.0	23.3		16.5	16.6	28.2
6-Apr	20.2 <sup>a</sup>	16.2			12.9		27.1	21.2		15.7	14.8	28.2
7-Apr		15.9	10.3		13.0	11.9	24.3	21.5	14.1	14.8	16.2	31.1
8-Apr		16.1	10.2		13.4	12.0	23.2	19.5	19.5	14.7	18.1	36.0
9-Apr		18.0	10.3		12.9	12.0	23.4	18.8	22.6	14.3	21.6	33.9
10-Apr		17.1	10.2	19.6	13.5	11.9	25.5	16.1	23.1	14.3	24.3	32.0
11-Apr		16.0	10.1	18.2	14.4	12.8	30.7	18.4	25.7	14.8	25.5	31.9
12-Apr		15.2	10.5	19.6	14.8	13.2	37.1	16.6	26.3	15.7	28.1	31.8
13-Apr		15.0	12.4	21.2	15.4	13.7	34.1	16.8	22.5	14.5	35.3	33.5
14-Apr		14.8	16.2	19.9	15.7	14.8	32.5	15.6	19.8	15.7	37.7	37.8
15-Apr		15.2	17.6	17.4	16.3	14.3	31.0	15.2	20.2	17.0	32.0	35.3
16-Apr		15.6	14.4	16.2	17.6	15.4	29.2	13.4	19.2	16.2	28.7	34.1
17-Apr		17.3	13.7	17.5	20.1	17.2	29.5	16.7	19.7	16.6	26.2	35.8

Mulherin Creek instream flow lease renewal

18-Apr		21.2	16.2	20.4	21.9	17.2	32.2	16.8	26.9	18.0	24.9	35.0
19-Apr		21.0	17.8	21.7	24.1	15.7	29.7	14.4	28.4	18.6	25.3	35.5
20-Apr		18.2	15.5	26.3	25.5	15.3	28.8	14.4	29.0	18.6	28.5	36.4
21-Apr		17.2	14.2	31.7	28.7	16.3	33.5	14.1	30.8	20.0	33.4	36.5
22-Apr		16.0	14.3	38.1	34.1	15.8	41.1	13.4	35.5	22.4	39.0	35.5
23-Apr		16.6	13.6	40.0	36.9	15.2	48.8	12.8	38.8	26.7	41.9	37.3
24-Apr		16.3	13.4	34.8	32.8	16.0	61.2	13.4	34.8	27.0	42.0	38.8
25-Apr		17.7	12.4	31.2	31.2	17.1	75.4	13.8	33.7	30.0	40.7	38.5
26-Apr		20.9	12.0	29.2	27.7	17.5	89.8	14.9	38.5	28.5	37.7	37.4
27-Apr		21.3	12.7	27.2	26.1	16.5	85.7	17.9	36.9	26.8	34.2	37.0
28-Apr		27.7	16.0	26.5	33.1	17.1	74.4	22.5	34.1	26.8	32.3	34.5
29-Apr		41.8	22.0	24.9	26.3	17.6	63.0	23.4	30.8	31.4	30.9	32.6
30-Apr		48.6	24.6	23.1	25.2	17.0	60.3	21.4	29.3	38.6	29.6	31.7
1-May		48.3	18.6	22.6	24.7	17.1	62.5	19.5	31.1	39.1	28.1	30.9
2-May		53.5	17.1	22.5	23.7	18.0	55.2	18.6	36.2	42.2	29.9	31.3
3-May	34.4 <sup>a</sup>	65.9	18.2	25.7	23.4	20.2	47.9	19.3	44.4	41.4	32.9	30.3
4-May		49.8	20.4	30.7	23.1	20.9	44.7	20.2	51.4	42.7	39.4	33.4
5-May		40.6	24.3	32.8	21.0	22.4	48.7	20.8	50.9	45.8	49.3	44.8
6-May		34.2	32.1	35.1	21.6	24.9	43.9	24.3	51.7	48.0	55.7	63.9
7-May		30.9	35.6	37.1	20.6	36.3	41.5	29.3	46.7	48.5	55.6	64.1
8-May		30.9	34.0	33.8	20.7	43.9	41.6	33.3	42.2	44.8	59.2	71.9
9-May		35.9	33.7	31.7	22.2	43.0	46.3	36.0	40.7	39.1	60.4	69.9
10-May		43.2	30.9	30.7	22.2	40.9	57.3	38.9	40.5	35.2	56.9	65.7
11-May		53.5	29.9	32.1	23.0	37.5	55.9	40.8	37.7	32.6	50.9	73.1
12-May		67.2	31.9	35.7	22.3	38.5	53.5	46.1	35.6	37.5	46.3	91.7
13-May		86.3	28.8	33.6	21.5	46.5	54.4	59.4	34.1	43.7	47.5	95.7
14-May		93.0	28.9	33.7	22.1	51.9	59.4	68.8	33.5	43.4	48.5	74.4
15-May		77.8	30.4	35.4	23.6	52.8	68.0	73.2	35.9	49.3	50.4	58.8
16-May		69.2	35.1	37.3	28.0	60.9	70.8	73.3	44.9	71.8	48.0	57.5
17-May		71.8	50.9	45.2	37.4	56.9	74.6	74.2	60.9	71.1	45.4	54.3
18-May		70.5	71.3	79.3	46.8	55.8	74.4	77.0	68.1	67.1	47.9	50.1

Mulherin Creek instream flow lease renewal

19-May		75.5	121	118.4	49.3	55.0	71.0	78.2	71.0	61.9	54.3	45.5
20-May		76.3	141	153.8	50.9	53.5	68.3	77.6	71.3	55.2	61.8	43.6
21-May		73.8	180	127.7	48.8	64.4	68.0	71.7	75.7	53.6	64.1	42.8
22-May		63.7	154	117.5	45.6	64.7	84.1	68.4	87.4	56.4	60.8	42.8
23-May		56.2	142	124.9	43.4	71.2	77.1	70.7	98.6	59.3	59.1	45.4
24-May		46.4	123	137.8	44.4	78.4	72.5	72.6	109.1	62.8	54.2	55.4
25-May		43.3	122	163.7	44.2	66.4	64.8	67.4	92.3	63.7	50.8	59.1
26-May		40.0	124	152.4	42.6	68.5	60.9	65.4	94.4	68.9	49.5	57.5
27-May		38.5	113	137.1	42.9	69.2	57.1	64.2	117.6	69.0	51.0	53.3
28-May		40.1	105	145.9	50.3	63.6	55.4	63.0	107.5	69.0	53.3	49.9
29-May		41.5	113	157.4	60.6	60.8	56.9	66.7	99.9	70.1	52.6	52.1
30-May		36.9	119	174.3	55.8	59.2	55.2	65.9	101.0	71.6	57.7	56.8
31-May		33.0	125	180.0	51.9	58.2	54.0	59.9	97.1	74.4	57.2	61.0
1-Jun	65.9 <sup>a</sup>	32.5	132	142.0	56.0	59.0	56.7	54.9	92.1	80.5	54.2	75.9
2-Jun		35.8	148	135.8	66.3	61.7	66.4	55.4	83.5	81.6	58.7	88.6
3-Jun		39.9	168	130.3	79.4	60.6	76.4	59.3	84.4	74.1	61.4	86.3
4-Jun		42.4	160	125.8	122	62.2	92.2	57.3	82.5	71.7	64.2	92.0
5-Jun		45.8	161	124.2	122	64.9	100.6	54.6	78.3	71.8	66.7	102.5
6-Jun		59.1	171	126.1	99.4	72.3	102.8	55.6	77.5	70.8	68.7	107.6
7-Jun		59.0	151	128.4	102	88.7	94.7	58.7	77.4	67.1	70.9	108.2
8-Jun		50.0	111	109.2	100	95.3	83.9	65.1	77.2	63.4	72.3	106.1
9-Jun		46.7	89.1	101.3	98.6	92.9	96.0	71.7	75.9	61.8	72.0	114.3
10-Jun		48.4	90.9	102.3	96.7	82.1	79.7	81.3	75.4	56.0	69.8	106.9
11-Jun		45.8	84.0	97.2	92.6	78.1	73.2	81.2	74.3	54.2	70.1	86.1
12-Jun		45.2	84.8	94.4	79.7	79.8	68.4	84.3	71.6	55.3	67.8	81.1
13-Jun		43.3	78.3	97.5	73.8	82.1	69.3	83.6	75.0	54.2	66.8	82.2
14-Jun		43.0	72.2	102.2	72.5	87.5	68.7	80.7	73.8	50.4	63.5	74.1
15-Jun		42.7	74.5	109.0	72.6	88.4	67.8	70.6	68.5	46.6	60.1	69.5
16-Jun		42.5	92.2	116.7	74.9	84.2	66.0	64.8	68.9	43.6	56.2	65.9
17-Jun		44.3	120	125.8	71.8	76.6	71.2	58.8	68.8	41.3	48.3	68.2
18-Jun		36.0	131	138.0	67.6	72.4	74.0	57.4	67.0	40.6	46.2	66.1

Mulherin Creek instream flow lease renewal

19-Jun		33.1	137	126.4	65.9	72.8	72.7	57.8	62.4	39.7	45.1	65.1
20-Jun		31.5	145	130.7	64.1	72.9	67.9	55.3	61.2	36.8	42.3	66.6
21-Jun		30.2	128	137.5	62.6	73.5	67.7	49.8	64.3	34.4	40.0	70.9
22-Jun		28.6	211	131.4	60.6	78.2	68.3	46.6	64.8	32.7	38.5	70.4
23-Jun		26.8	196	111.4	58.8	83.7	69.2	43.9	64.3	30.9	37.1	63.5
24-Jun		25.1	218	105.5	58.7	76.0	70.4	42.7	65.6	28.9	35.7	64.7
25-Jun		23.0	210	107.2	59.6	71.7	70.5	44.8	66.8	27.4	34.8	65.1
26-Jun		19.3	213	112.7	63.5	66.1	71.8	44.7	69.9	24.5	33.6	64.3
27-Jun		19.5	191	104.9	59.9	65.6	68.8	44.9	76.7	23.1	31.9	61.3
28-Jun		20.0	171	99.0	59.3	60.9	64.0	44.2	76.5	23.0	30.5	60.4
29-Jun		19.7	171	94.9	58.0	62.0	61.3	44.6	72.9	23.1	29.5	59.9
30-Jun		17.5	165	93.8	60.0	82.5	58.6	44.2	68.7	21.9	29.1	54.1
1-Jul		15.1	157	90.3	60.3	78.7	56.6	42.5	63.1	20.7	28.4	55.0
2-Jul		14.5	169	81.8	56.6	74.7	54.0	40.8	59.3	20.0	31.0	53.7
3-Jul		14.1	167	77.7	55.3	75.4	51.9	39.2	56.6	19.3	29.8	51.6
4-Jul		13.8	164	74.0	51.1	82.4	49.5	38.0	55.9	18.5	28.0	52.4
5-Jul		13.6	161	68.9	47.5	81.7	46.9	39.5	55.0	24.1	26.3	50.2
6-Jul	31.1 <sup>a</sup>	12.8	133	65.5	46.6	80.5	43.4	38.2	51.4	26.5	25.3	48.6
7-Jul		13.3	107	63.6	40.9	86.9	42.0	36.2	48.5	21.3	24.5	48.6
8-Jul		13.2	99.3	61.9	37.5	77.6	40.5	41.1	46.2	19.9	23.0	46.8
9-Jul		12.1	85.6	57.4	35.8	77.1	37.5	36.0	44.5	19.2	21.4	46.5
10-Jul		11.4	79.8	53.5	34.1	77.0	35.5	33.5	42.8	18.3	28.3	44.8
11-Jul		11.0	70.3	52.6	33.6	75.3	34.9	31.6	42.2	17.6	25.6	42.3
12-Jul		10.8	62.6	51.0	32.5	75.2	33.5	29.7	40.7	16.6	22.9	40.3
13-Jul		10.6	57.3	57.9	31.1	72.0	32.7	28.9	38.5	16.7	21.5	38.8
14-Jul		10.2	51.5	52.1	30.0	66.9	33.2	28.1	37.0	16.3	20.5	37.7
15-Jul		9.9	48.2	49.9	28.8	67.6	33.7	25.0	35.4	16.9	19.7	37.2
16-Jul		10.1	44.9	46.5	27.9	65.7	33.2	23.5	33.7	17.1	19.3	38.6
17-Jul		10.1	43.1	43.9	27.9	64.7	31.7	26.3	31.2	16.6	17.7	37.0
18-Jul		10.6	45.0	40.8	27.5	63.4	29.4	25.6	30.6	15.6	16.2	37.6
19-Jul		10.0	43.6	41.2	26.1	63.0	26.1	25.1	29.5	14.8	17.6	33.9



Mulherin Creek instream flow lease renewal

20-Jul		9.7	42.7	40.1	24.6	60.0	26.4	24.6	27.1	13.3	17.3	32.8
21-Jul		9.0	41.0	37.6	23.5	55.3	25.8	23.1	30.3	12.9	14.1	31.7
22-Jul		8.0	47.0	38.0	24.8	56.0	25.3	21.5	29.2	12.6	13.7	30.4
23-Jul		8.1	50.8	38.1	23.1	54.4	24.7	20.5	26.0	16.3	12.6	29.7
24-Jul		8.9	48.1	37.9	22.5	52.1	23.9	19.3	25.2	14.5	12.8	29.0
25-Jul	16.1 <sup>a</sup>	9.7	45.4	37.6	21.6	52.3	23.0	18.7	24.8	15.2	12.1	27.9
26-Jul		10.0	40.9	38.1	21.1	52.3	22.4	17.3	22.8	12.8	11.9	28.0
27-Jul		10.1	38.4	40.9	21.2	50.0	24.1	16.8	21.3	13.2	11.6	29.1
28-Jul		8.1	35.9	38.4	21.0	49.4	23.9	17.7	20.6	14.4	12.0	28.7
29-Jul		8.0	37.0	36.2	20.9	47.7	22.6	17.1	20.5	13.2	11.7	28.2
30-Jul		7.6	35.8	33.0	19.9	47.3	21.5	18.3	20.2	12.5	11.5	27.9
31-Jul		7.3	29.2	29.6	19.9	46.6	20.6	17.9	19.5	13.1	11.3	26.9
1-Aug		7.2	29.2	29.5	19.8	46.6	20.4	18.4	19.2	12.9	10.8	25.2
2-Aug		7.4	29.0	27.9	19.0	47.7	19.7	17.2	19.5	10.7	9.9	24.6
3-Aug	13.6 <sup>a</sup>	7.4	27.0	28.0	18.6	46.2	19.5	16.9	19.0	9.8	8.0	24.3
4-Aug		7.2	25.6	26.6	18.5	45.3	19.6	16.6	20.0	10.1	8.0	24.3
5-Aug		7.3	25.4	25.9	18.3	44.0	20.1	16.3	24.5	12.7	8.0	24.4
6-Aug		7.8	23.1	31.1	19.4	42.6	20.5	16.0	22.6	15.8	8.3	24.1
7-Aug		7.2	23.2	28.8	21.0	44.1	21.7	15.5	19.6	14.7	9.3	23.8
8-Aug		7.1	26.8	26.0	20.9	42.8	21.3	14.5	20.0	25.6	8.2	22.9
9-Aug		6.8	26.8	27.7	20.6	42.4	20.5	14.2	20.3	20.7	7.5	22.6
10-Aug		7.1	26.5	25.4	22.0	41.7	22.1	13.5	18.9	16.3	7.5	22.4
11-Aug		7.6	23.9	24.0	21.5	38.7	23.6	13.1	17.9	14.4	7.5	21.8
12-Aug		7.0	22.3	22.5	19.7	36.5	21.3	13.0	16.9	13.6	7.7	21.4
13-Aug		6.1	22.6	21.6	20.6	35.2	20.4	13.2	15.8	13.7	7.8	22.0
14-Aug		6.4	23.9	21.2	21.0	34.4	19.5	13.2	15.8	12.5	7.5	24.2
15-Aug		6.3	23.6	22.5	20.5	34.4	19.6	12.5	15.6	12.2	7.6	22.6
16-Aug		5.8	22.5	23.8	21.9	33.8	19.7	11.7	14.8	11.3	7.9	21.7
17-Aug		6.4	22.2	21.8	19.3	33.5	18.8	11.5	14.6	10.8	7.7	21.2
18-Aug		7.3	22.0	25.3	18.1	32.6	17.8	11.5	14.5	10.9	7.7	21.8
19-Aug		6.9	21.6	22.8	18.2	30.4	17.5	11.0	15.3	10.9	8.0	23.0

Mulherin Creek instream flow lease renewal

20-Aug		6.2	21.6	19.8	17.6	27.7	17.7	10.3	18.7	10.4	7.3	22.5
21-Aug	6.5	6.0	21.5	19.4	16.8	26.6	17.1	9.8	20.3	10.1	7.1	21.8
22-Aug	6.4	5.9	19.4	19.1	19.5	26.7	16.7	9.7	21.4	10.4	6.8	20.3
23-Aug	6.3	5.9	18.7	19.1	19.6	25.3	16.3	9.3	25.6	10.8	6.6	20.0
24-Aug	6.7	6.0	18.3	25.8	17.2	24.0	15.6	9.3	23.0	10.2	6.7	20.6
25-Aug	9.2	5.8	17.9	20.2	16.6	23.4	15.3	9.5	21.6	10.3	7.0	21.5
26-Aug	13.7	5.5	18.3	19.3	16.2	22.6	15.1	9.1	19.4	10.6	7.0	20.9
27-Aug	13.0	5.5	18.4	18.7	15.6	22.6	14.6	9.2	16.5	10.5	7.2	19.5
28-Aug	13.3	5.5	17.9	18.5	19.4	22.8	13.6	9.2	15.9	10.3	8.0	18.8
29-Aug	12.7	5.6	18.0	17.9	25.0	23.1	12.9	9.6	17.0	9.9	8.1	18.8
30-Aug	10.8	5.4	17.9	17.5	20.6	22.7	12.4	9.6	24.0	10.0	8.1	18.6
31-Aug	6.4	5.6	18.9	18.8	21.0	24.3	11.0	9.2	26.8	9.6	7.9	18.6
1-Sep	6.3	6.1	21.0	18.4	21.6	25.2	13.4	9.3	22.9	9.3	7.7	18.5
2-Sep	6.5	5.6	20.4	17.5	21.4	25.6	12.3	9.4	19.6	9.4	7.7	17.2
3-Sep	6.3	5.6	20.6	17.2	19.8	25.4	10.6	9.7	18.1	9.7	7.8	16.7
4-Sep	6.2	5.4	20.9	17.4	19.1	24.9	10.9	10.3	17.6	10.3	9.2	17.1
5-Sep	6.3	5.5	20.8	17.5	19.6	25.0	11.1	10.7	17.2	10.7	12.6	17.8
6-Sep	6.2	6.3	20.7	17.3	20.2	24.5	11.0	10.0	16.6	10.0	12.1	17.0
7-Sep	6.1	6.1	20.9	19.4	19.2	24.1	11.2	10.1	16.4	10.1	11.5	16.9
8-Sep	6.3	5.6	20.0	19.0	19.0	23.7	10.8	9.7	16.6	9.7	11.1	16.8
9-Sep	6.6	5.5	18.7	18.8	19.6	22.8	10.3	9.3	18.6	9.3	11.2	17.3
10-Sep	6.2	5.5	20.8	18.7	20.2	21.7	9.7	9.1	19.3	9.1	11.0	17.5
11-Sep	6.1	5.6	19.8	18.2	19.3		9.4	9.2	19.4	9.2	10.8	17.3
12-Sep	6.1	5.5	18.7	18.2	18.4		9.3	9.2	18.0	9.2	11.6	16.6
13-Sep	5.9	5.5	19.2	18.3	17.7		9.2	9.0	15.6	9.0	12.0	15.9
14-Sep	5.8	5.7	19.7	18.4	17.6		9.4	9.4	15.2	9.4	12.6	18.2
15-Sep	6.6	5.9	18.2	18.1	17.5		9.5	14.2	14.5	14.2	12.5	24.6
16-Sep	6.6	5.9	18.1	18.3	17.2	24.0 <sup>a</sup>	9.6	20.7	13.8	20.7	12.3	23.9
17-Sep	6.0	5.9	17.8	18.1	17.1		9.7	21.7	14.0	21.7	12.3	22.8
18-Sep	5.9	8.1	18.2	18.0	17.1		9.4	22.0	14.9	22.0	12.7	23.1
19-Sep	5.8	7.3	17.9	17.9	16.7		9.1	19.2	15.2	19.2	12.5	31.0

Mulherin Creek instream flow lease renewal

20-Sep	6.2	7.2	18.5	17.8	16.2	24.3 <sup>a</sup>	8.9	17.2	14.4	17.2	12.8	25.2
21-Sep	9.1	7.1	19.4	17.8	16.0		8.7	16.0	14.2	16.0	13.7	28.0
22-Sep	11.6	7.4	19.6	17.9	15.8		8.4	15.5	14.6	15.5	17.3	27.3
23-Sep	12.7	7.9	19.3	18.3	15.8		9.4	15.3	14.3	15.3	21.7	25.6
24-Sep	12.3	9.2	18.6	18.1	15.2		10.5	14.7	13.8	14.7	14.5	25.3
25-Sep	12.1	8.4	18.3	17.5	15.0		12.1	14.2	13.0	14.2	12.5	24.6
26-Sep	11.4	8.0	18.3	17.5	15.0		14.9	13.8	12.1	13.8	12.1	24.4
27-Sep	11.3	7.6	18.5	17.2	14.6		13.8	13.5	27.4	13.5	12.7	24.5
28-Sep	10.9	7.6	18.2	16.9	14.4		13.7	13.5	28.5	13.5	13.9	24.2
29-Sep	11.4	8.7	18.0	17.5	14.8		13.9	13.4	23.7	13.4	13.8	24.1
30-Sep	11.7	9.0	17.8	17.7	15.8		13.8	13.6	21.7	13.6	14.9	24.8
1-Oct	11.9	9.2	18.0	17.7	15.7		13.8	14.8	23.4	14.8	15.7	26.2
2-Oct	13.5	10.8	18.0	17.5	15.9		14.5	17.9	21.6	17.9	18.9	24.7
3-Oct	27.3	11.0	18.1	17.5	15.5		14.8	18.1	20.6	18.1	31.0	23.6
4-Oct	16.3	12.1	19.0	17.7	15.7		15.4	17.1	20.7	17.1	22.7	23.6
5-Oct	15.4	14.1	19.4	17.9	16.0		15.3	17.9	20.1	17.9	19.5	23.6
6-Oct	15.1	13.5	19.8	17.9	16.6		14.7	19.4	19.6	19.4	18.6	22.9
7-Oct	21.4	11.4	19.2	18.9	16.7		15.4	19.1	19.6	19.1	17.8	23.1
8-Oct	18.1	11.7	19.2	18.9	16.1		15.6	18.7	19.4	18.7	16.3	23.2
9-Oct	20.1	12.2	19.4	17.0	16.7		15.5	18.6	19.3	18.6	14.6	22.2
10-Oct	18.2	12.7	19.6	15.2	15.8		15.2	18.2	19.1	18.2	16.3	21.9
11-Oct	19.9	13.0	19.0	14.8	16.4	25 <sup>a</sup>	15.0	18.1	18.9	18.1	16.8	21.9
12-Oct	19.0	12.2	19.6	15.0	15.5		15.0	18.3	23.1	18.3	16.8	22.0
13-Oct	17.9	12.2	19.7	15.4	15.1		15.0	17.9	20.3	17.9	17.3	21.7
14-Oct	17.5	11.8	20.2	20.4	15.5		14.9	17.3	19.9	17.3	20.3	21.7
15-Oct	17.6	11.4	20.6	22.6	14.9		15.0	17.2	19.7	17.2	28.9	21.3
16-Oct	25.1	11.5	20.9	19.0	15.3		17.6	17.3	19.2	17.3	39.4	21.2
17-Oct	23.1	12.1	21.0	18.7	16.4		15.8	17.1	18.9	17.1	29.7	21.2
18-Oct	20.0	11.6	21.9	19.5	15.4		14.7	17.3	18.9	17.3	25.8	21.2
19-Oct	20.8	17.7	21.9	20.1	15.2		15.2	18.1	18.5	18.1	23.8	21.0
20-Oct	22.7	26.2	22.7	21.3	15.0		17.3	22.3	18.3	22.3	22.4	21.3

# Mulherin Creek instream flow lease renewal

[illegible]